PROJECT NOTE

Site Name: Blades Groundwater Site

City, County, State: Blades, Sussex County, Delaware

Subject: Radius of Influence, Town of Blades Water Supply System

Date: May 10, 2019

Prepared By:

Nonresponsive based on revised scope

This project note presents a calculation of the estimated radius of influence for the Town of Blades water supply wells. There are three active wells in the system (Wells 1, 2, and 3), all of which are **Ex. 9 - Wells** (see Figure 2 of this HRS documentation record).

The following assumptions were applied to the calculation:

- The three wells are pumped from the same aquifer (Columbia Aquifer) on a rotating cycle, with each well contributing comparable amounts to the system over a month's time, the combined flow rate is evaluated (Ref. 16, pp. 2, 4, 6, and 8). [Note: as a result of the findings of PFAS in the public supply wells in 2018, supply wells 1 and 2 were not used throughout most of 2018.] The drinking water system annual capacity of 100249.9 gallons per day (gpd) or approximately 76.6 gallons per minute (gpm), is assumed to be the maximum combined flow rate (Q). [Ref. 16, pp. 4-54].

- As the wells are within close proximity to each other (300 feet, 150 feet between each well) and pump on a rotating cycle at comparable pumping rates and capacities, the point of measurement for the maximum potential radius of influence for the combined system for this evaluation is PW-2.

- The Hazard Ranking System (HRS) indicates that the net precipitation (i.e., recharge rate [R] to the unconfined aquifer) is 15 to 30 inches per year [Ref. 1, Figure 3-2 and Table 3-4], which is comparable to the long-term average recharge rate in southwestern Delaware of 14 inches (Ref. 44, p. 27). To calculate the maximum potential radius of influence, the minimum expected recharge value of 14 inches per year is used.

The equation for radius of influence (r) for a pumping well in a phreatic aquifer (i.e., unconfined aquifer) is found in Section 3.1 of Reference E (De Smedt, 2009) and is presented below:

$$r = \sqrt{\left(\frac{Q}{\pi R}\right)}$$

Where Q = flow rate = 115,568 gpd and
R = recharge rate = 14 in/yr

Therefore,

$$r = \sqrt{(110,294\ gal/d \times 0.134\ cf/gal \times 365d/yr \div \pi \times 14in/yr \times 0.083ft/in)}$$
$$= 1,215.71\ ft \div 5,280\ ft/mi = 0.23\ mi$$

Based on the calculation, the maximum radius of influence for the Town of Blades water supply system wells is estimated to be 1,214.4 feet (0.23 - mile). The zone of influence based on this calculated maximum is depicted in the attached map.

References:
1. U.S. Environmental Protection Agency (EPA). Hazard Ranking System, Final Rule. Federal Register, Volume 55, No. 241, pp. 51532–51667. December 14, 1990. Available at http://semspub.epa.gov/src/document/HQ/174028 [136 pages]
16. O'Loughlin, Connor, EPA. Electronic Mail Correspondence with Nancy Shannon, WESTON, Regarding FOIA Request to DNREC for the Town of Blades Well Permits and Completion Reports, with attachments. February 26, 2019. [54 pages]
44. Delaware Geological Survey (DGS). Hydrogeology and Geochemistry of the Unconfined Aquifer West-Central and Southwestern Delaware. Report of Investigation No. 41. University of Delaware. June 1986. [109 pages]
63. E. De Smedt, Prof. Dr. Ir. F., Department of Hydrology and Hydraulic Engineering, Faculty of Applied Sciences, Free University Brussel. Groundwater Hydrology Course Notes. October 2009.

DATE	GALLONS		Date	Gallons		Date	Gallons
3/29/2018	3,769,420		Jan-17	3,110,470		Jan-16	2,228,451
4/30/2018	4,162,120		Feb-17	2,829,780		Feb-16	1,952,942
5/31/2018	4,860,540		Mar-17	2,971,340		Mar-16	2,076,246
6/28/2018	4,493,740		Apr-17	2,738,880		Apr-16	2,190,168
7/31/2018	4,760,950		May-17	2,922,910		May-16	2,316,269
8/29/2018	4,238,340		Jun-17	3,317,490		Jun-16	2,643,844
9/28/2018	2,801,460		Jul-17	3,688,360		Jul-16	2,784,940
10/30/2018	2,769,820		Aug-17	3,612,980		Aug-16	3,209,010
11/30/2018	2,544,320		Sep-17	3,996,560		Sep-16	3,311,420
1/2/2019	2,757,455		Oct-17	3,918,400		Oct-16	3,513,850
1/31/2019	3,263,946		Nov-17	3,516,450		Nov-16	3,049,660
3/1/2019	2,691,349		Dec-17	3,212,190		Dec-16	2,869,890
3/29/2019	2,838,499		Total	39,835,810		Total	32,146,690
Total	45,951,959						

	Totals						
MINUTES	GALLONS	GPM	GPD	CF/D	Compared to WHPA calc.		
1,576,800	120,772,958	76.6	110,294.9	15,449.3	0.2675		

Legend

- Monitoring Well

### Ex. 9 - Wells

- Background Well
- Radius of Influence (0.24 Miles)
- Former Peninsula Plating Facility
- Former Seaford Steel Products
- Former Blades Commercial Complex
- Procino Plating
- Town of Blades Boundary

Imagery: ESRI Mapping Service

The source of this map image is Esri, used by the EPA with Esri's permission

Coordinate System:
WGS84 UTM Zone 18N Feet

N

| 0 | 175 | 350 | 525 | 700 |

Feet
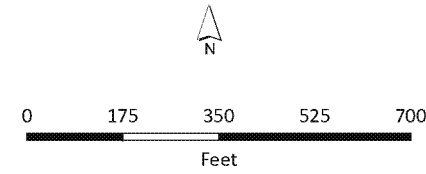
Blades Groundwater
Blades, Sussex County, DE

Radius of Influence Map

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